

# Depleted Uranium and Veterans' Health:

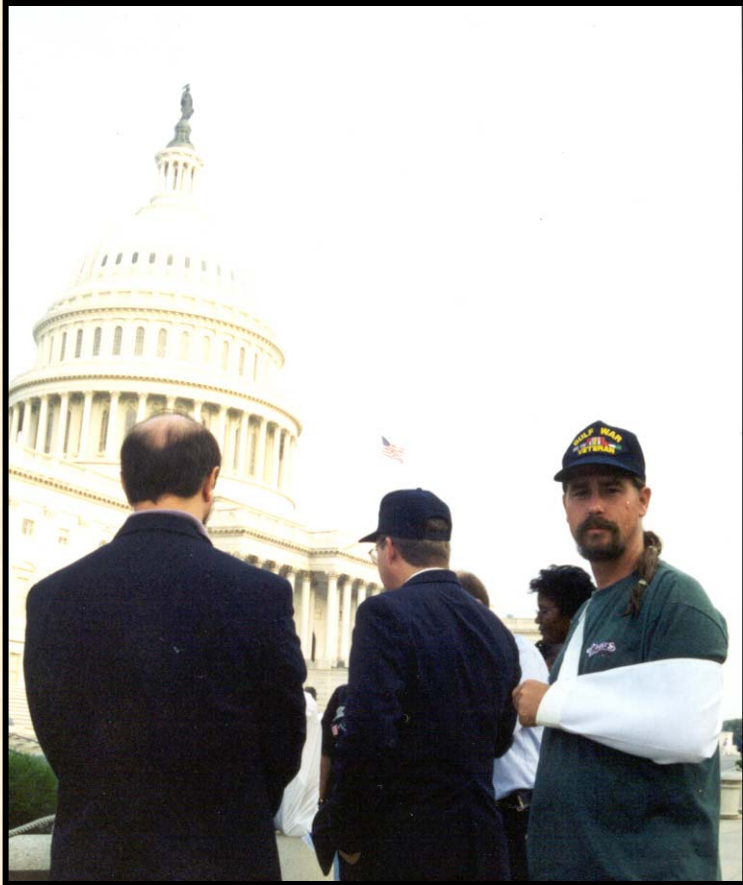
A Flawed Testing Process and an  
Undersized, Politicized Study Limit  
Evaluation of Exposures and Effects

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# Part I: Has DU Affected Gulf War Veterans' Health?



- How many veterans were exposed?
- How much were they exposed to?
- Is the DVA study of veterans sufficiently large to inform policy decisions about Gulf War veterans' health care and benefits?
- Have all observed, clinically-significant health effects among study participants been reported?

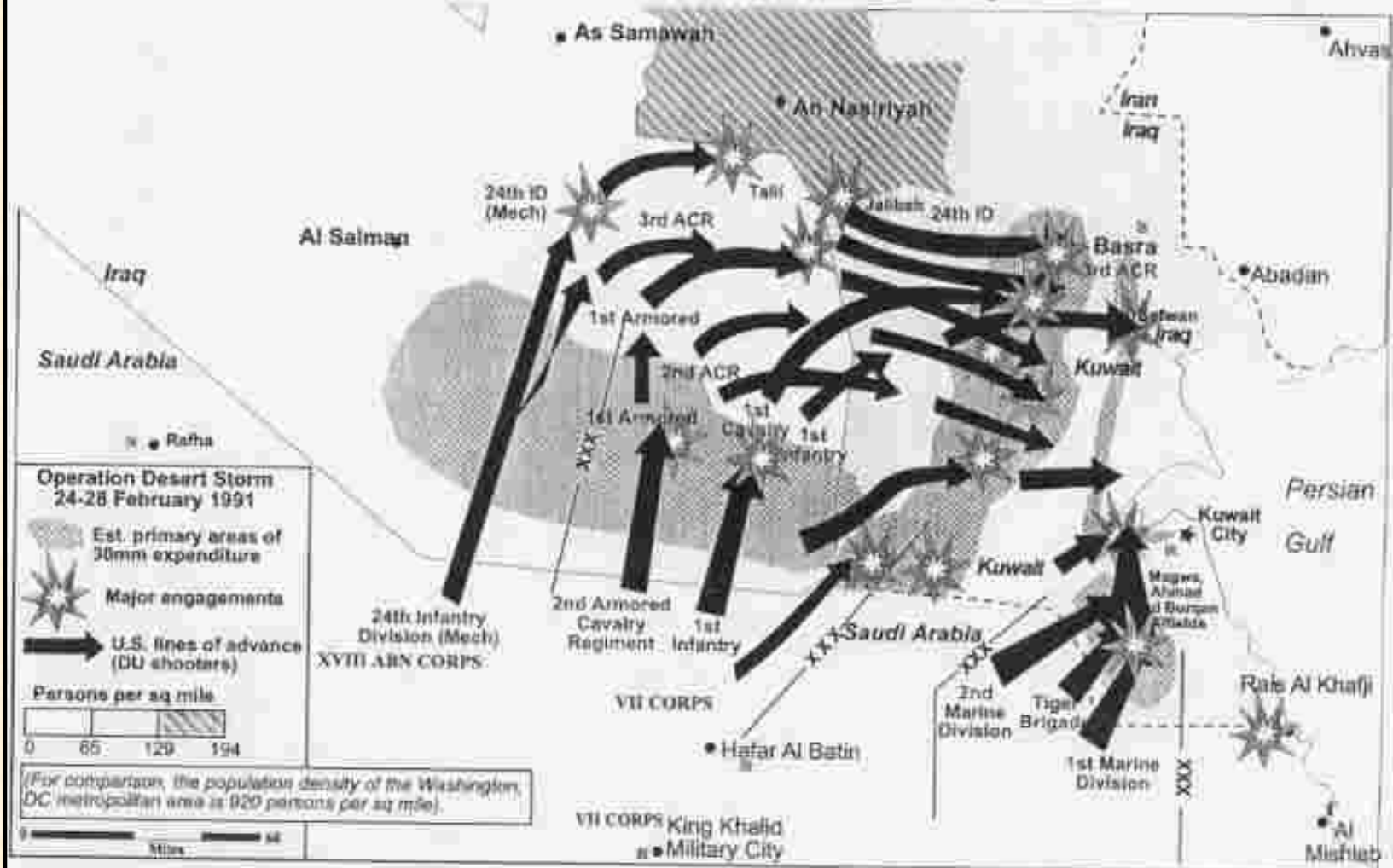
# U.S. Use of DU Munitions in Combat

(Fahey *In press*)

	Number of Rounds	Weight (kg)
<b>1991: Saudi Arabia, Kuwait, Iraq</b>	>860,000	286,000
<b>1994-1995: Bosnia</b>	10,800	3,200
<b>1999: Kosovo, Serbia, and Montenegro</b>	31,800	9,500
<b>2001-2007: Afghanistan</b>	?	?
<b>2003-2007: Iraq</b>	>200,000	Est. 100,000 to 150,000

# DU in the 1991 Gulf War

## Primary Areas of DU Expenditure



Source: US Department of Defense, November 19, 1998

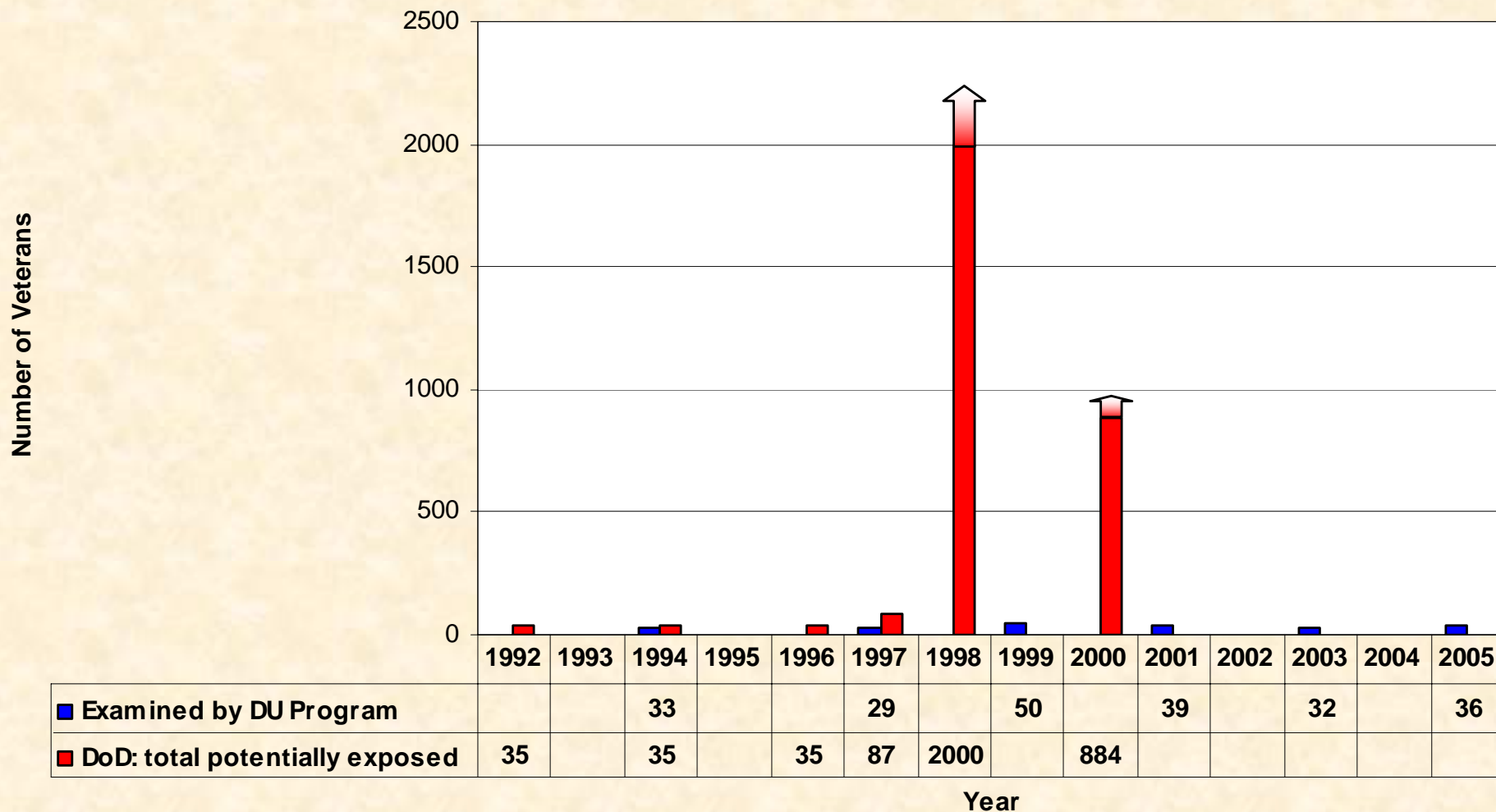


# Troops not warned of DU hazards

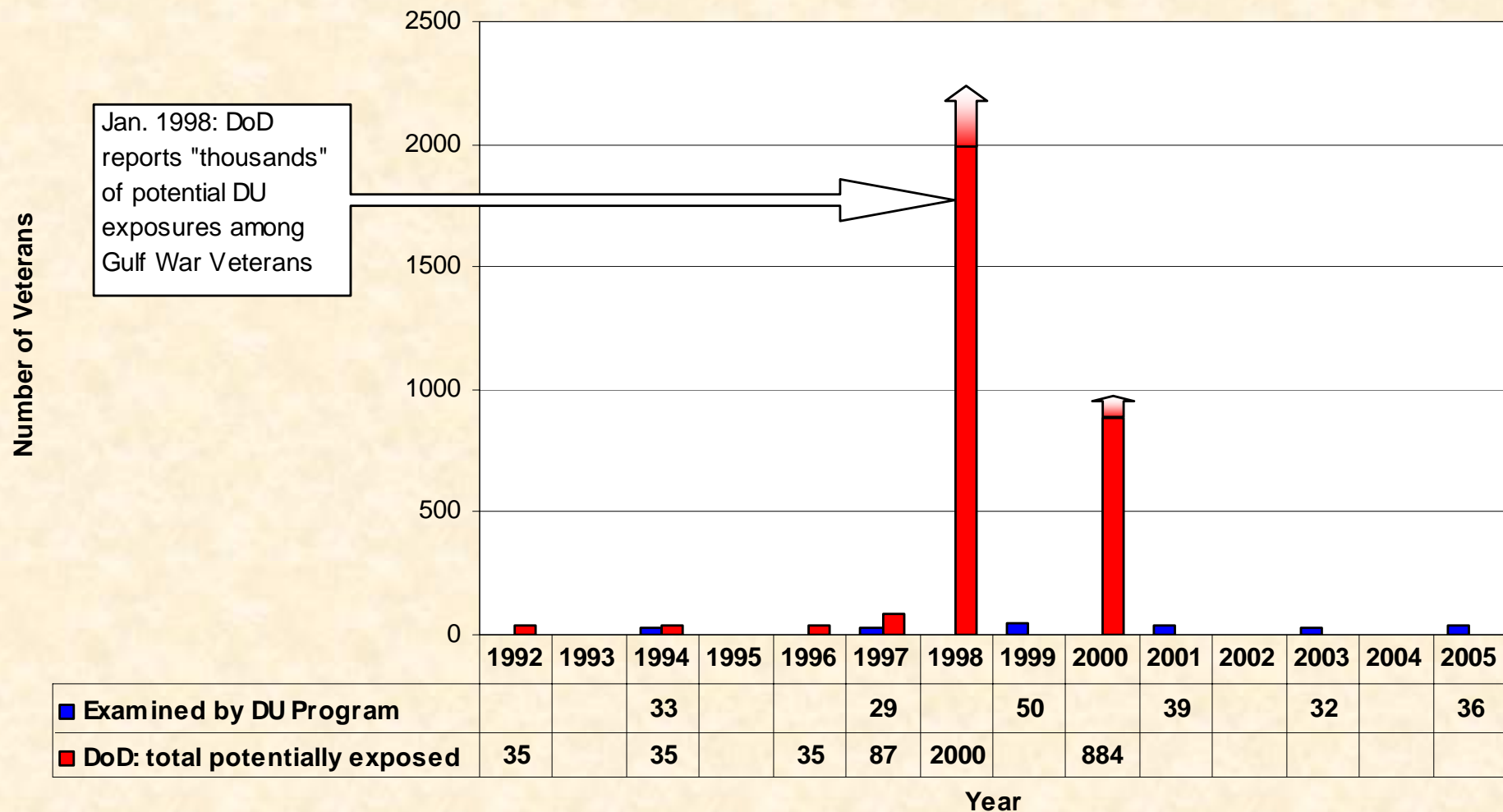


- 1991: 29 U.S. vehicles and hundreds of Iraqi vehicles contaminated by DU
- More than 100 U.S. soldiers in vehicles survive DU impacts
- Dozens to hundreds of troops involved in rescue operations and recovery of vehicles
- “Thousands” of troops in contaminated battlefield areas
- July 1991 Doha, Kuwait munitions fire: soldiers not warned of DU hazard during the fire or subsequent clean-up

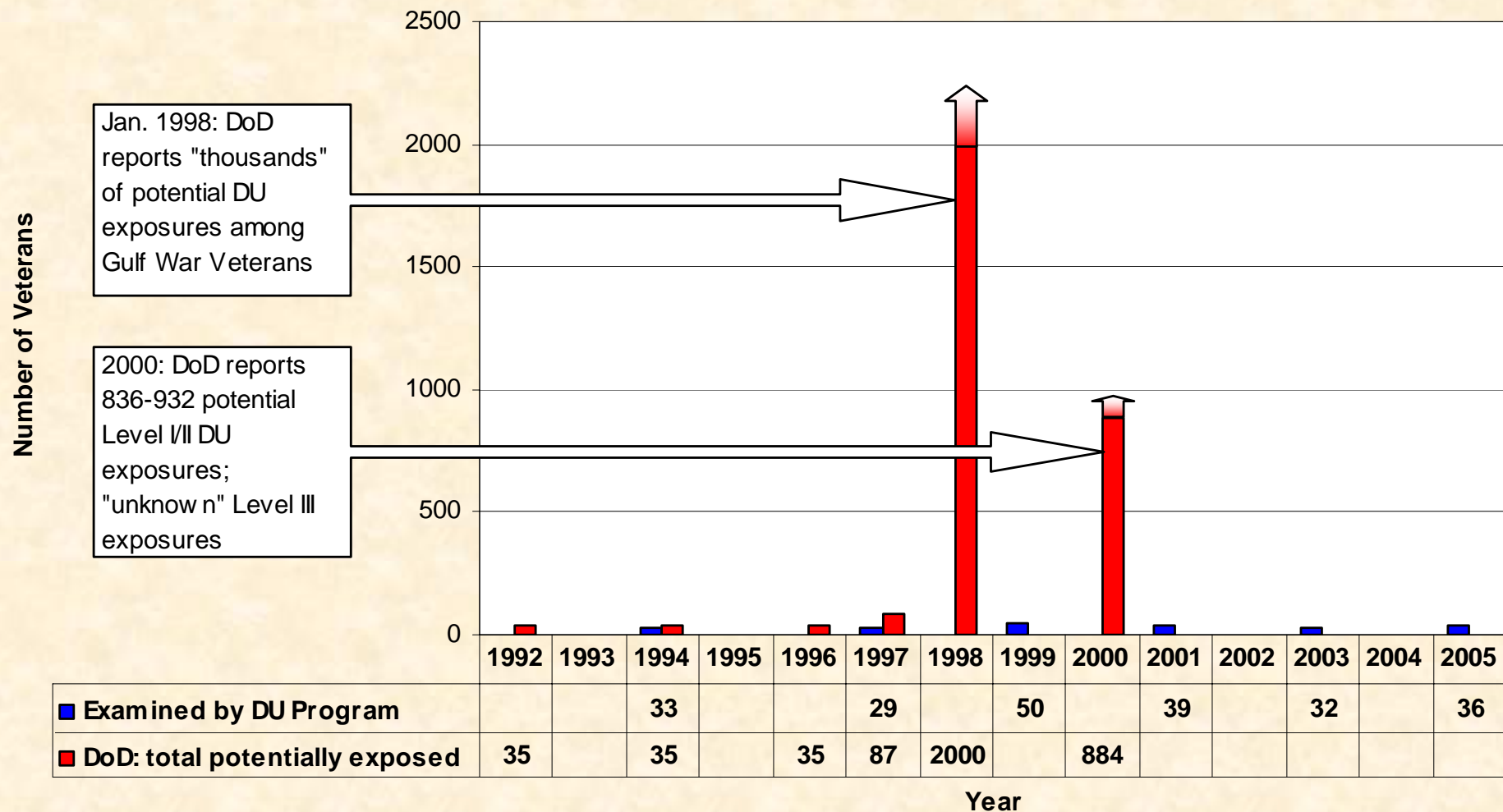
# DoD-reported Potential DU Exposures among Gulf War Veterans v. DU-exposed Gulf War Veterans Examined by DVA's DU Program 1992-2005



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# **Veterans' exposure estimates should be compared to “Members of the Public” limits on intake**

- Occupational workers receive training, hazard warnings, protective equipment, and testing for exposure
- The vast majority of Gulf War veterans' received no training, hazard warnings, protective equipment, or testing for exposure

# U.S. Army Estimates and U.S. Government Recommended Limits on Intake (RLI)

(Fahey *In press*)

	U.S. Army “Most Likely” Estimate	U.S. Army “Upper Bound” Estimate	U.S. RLI Members of the Public	U.S. RLI Occupational Workers
Soldiers in an armored vehicle penetrated by a DU round	10-280 mg / 1 min 43-710 mg / 10 min	91-970 mg / 1 hr 110-1,000 / 2 hrs		
Soldiers who enter vehicles to rescue occupants immediately after a DU impact	27-200 mg / 10 min	No estimate	0.05 mg / 15 min 0.5 mg / day	0.18 mg / 15 min 2 mg / day 10mg / week 480 mg / year
People who work in and around DU-impacted equipment	0.45 mg / 1 hr (inhalation) 10.6 mg / 1 hr (ingestion)	14.5 mg / 10 hrs (inhalation) 10.6 mg / 10 hrs (ingestion)		

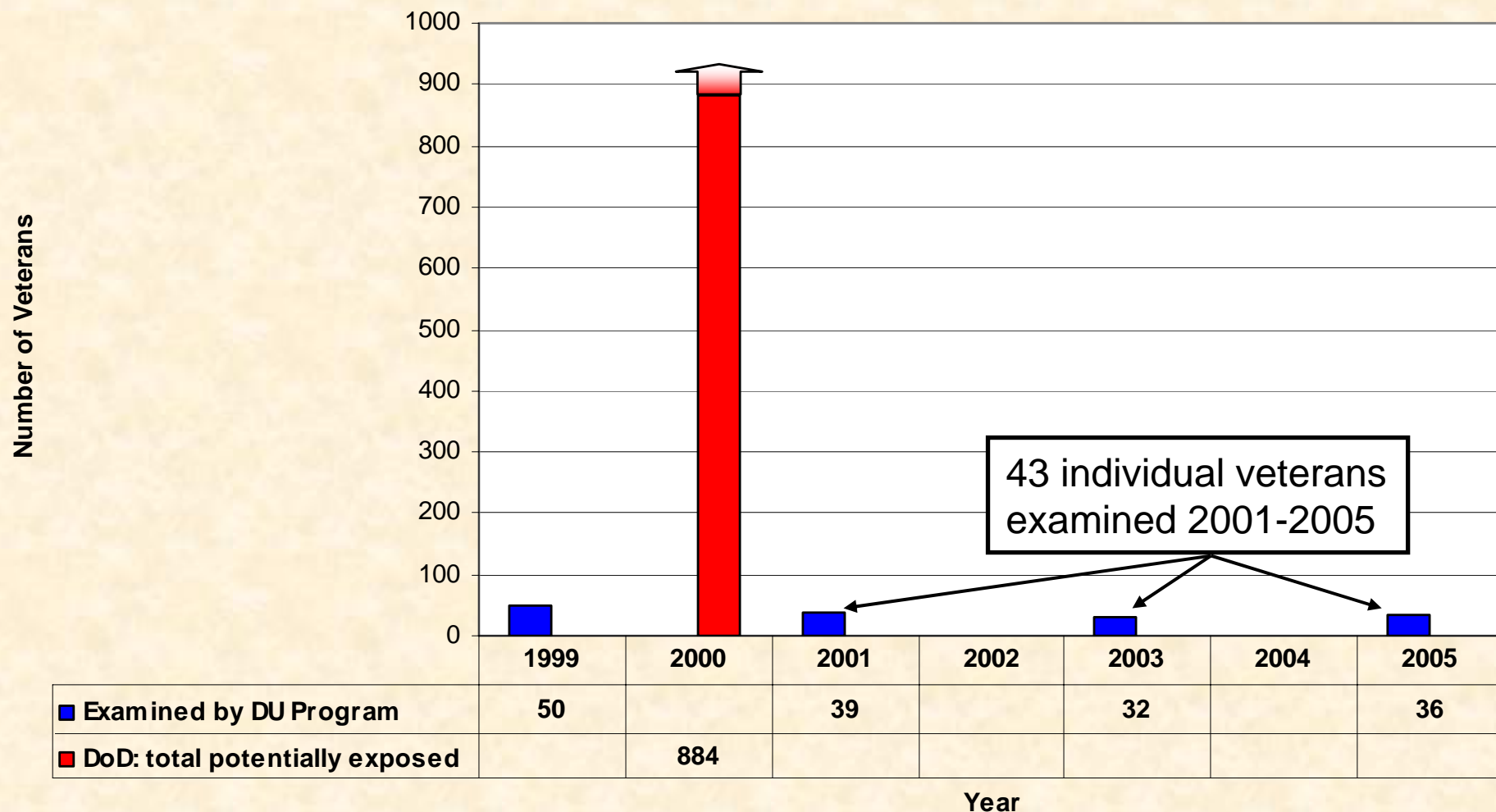
# Royal Society Estimates and International Recommended Limits on Intake (RLI)

(Fahey *In press*)

	Royal Society “Central” Estimate	Royal Society “Worst Case” Estimate
Soldiers in an armored vehicle penetrated by a DU round	250 mg / 1 min	5000 mg / 1 hour
Soldiers who enter vehicles to rescue occupants immediately after a DU impact	250 mg / 1 min	5000 mg / 1 hour
People who work in and around DU-impacted equipment	1 mg / 1 hour (inhalation) 0.5 mg / 1 hour (ingestion)	200 mg / 10 hours (inhalation) 50 mg / 10 hours (ingestion)

International RLI Members of the Public	International RLI Occupational Workers
0.035 mg / day 4.5 mg / year	0.18 mg / 15 min 2 mg/day 130 mg/year

# DoD-reported Potential DU Exposures among Gulf War Veterans v. DU-exposed Gulf War Veterans Examined by DVA's DU Program 2000-2007



# Is the study large enough to predict future health effects in veterans?

## NO

- **DVA, 1993:** “The small size of the population [**33 veterans**]...[makes it] highly unlikely that definitive conclusions concerning cancer induction will be obtained from the study.”

## YES

- **McDiarmid et al 2001:** “Observations in this group of [**50 veterans**] prompt speculation about the health effects of DU in other exposure scenarios.”
- **McDiarmid et al 2004:** “Findings observed in this chronically exposed cohort [**39 veterans**] offer guidance for predicting future health effects in other potentially exposed populations...”

***What accounts for this change in opinion on the significance of the study size?***



# Politics, Science, and DU

## 1999-2001

- 1999
  - US shoots DU during Kosovo conflict
  - Hodgkin's lymphoma and bone tumor observed in DVA study
- 2000
  - DU controversy erupts in Europe
  - DU (and US and NATO) blamed for leukemias, cancers
- 2001
  - In Europe, Pentagon officials deny any cancers in DVA study
  - Dr. McDiarmid publishes *BMJ* article at the height of the European controversy; no mention of Hodgkin's lymphoma or bone tumor

# October 1999 meeting attended by Dr. Kilpatrick: “One of the thirty [new veterans]...has Lymphoma.”

## MEMORANDUM FOR RECORD

**SUBJECT:** Meeting with Dr. Melissa McDiarmid and her staff on October 15, 1999 to discuss the Baltimore DU Follow-Up Program and the Extended Follow-Up program.

### DISCUSSION:

- 1.) On October 15, 1999 from 10AM to 12:30PM a representatives from OSAGWI met with VA representatives to discuss the DU medical follow-up programs. The following individuals were in attendance:

#### OSAGWI Representatives

Dr. Bernard Roskter  
Dale Vesser  
Capt. Steve Wellock  
Col. O'Donnell  
Dr. Mike Kilpatrick  
Dr. Kelley Brix  
Dr. David Case  
Patrick Williams

#### PSOB Representatives

Dr. Alan Steinman (On conference phone)  
Mike Naylor  
Bill Taylor

#### VA Headquarters Representatives

Dr. Susan Mather  
Dr. Mark Brown  
Bob Devesty  
Dr. Neil Otchin  
Dr. John Kraemer

#### VA Baltimore Representatives

Dr. Mohammed Al Abraham  
Dr. Melissa McDiarmid  
Dr. Katherine Squibb  
Jane Stolte

- 6.) Dr. McDiarmid said that 30 new veterans had been added to the Baltimore Follow-up program, including four with shrapnel detectable on x-rays. The four shrapnel cases were the only new Baltimore program participants who had urinary uranium levels above 100 ng/g creatinine. One of the thirty, a non-shrapnel case, has Lymphoma. Dr. McDiarmid believes that some of the thirty new patients have not been identified as friendly fire victims by DoD. She promised to ask these individuals if they would like to call OSAGWI.

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# Depleted Uranium

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Office of the Special Assistant  
(703) 578-8510

COL Eric G. Daxon, PhD, CHP  
US Army Medical Command  
(210) 221-6612

# Medical Surveillance

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- Medical surveillance of individuals in or on vehicles hit by DU friendly fire
  - No cancers or leukemias
  - No subsequent medical problems from the DU exposure
  - One third with embedded DU fragments
  - Urine uranium levels normal in those without DU fragments

**McDiarmid's *British Medical Journal* article  
“Depleted uranium and public health,”  
20 January 2001**

- “None of these veterans [15 with DU fragments] has leukaemia, bone cancer, or lung cancer.”
- Why no mention of Hodgkin's lymphoma or bone tumor?



## **McDiarmid et al (Dec. 2001) article downplays significance of Lymphoma finding, ignores bone tumor:**

- “Of note, there was one report of Hodgkin’s disease in a newly identified member of the low urine uranium group. First diagnosed approximately 4 years after his Gulf War service, neither his private physicians nor he believed it to be DU-related. Hodgkin’s disease is not thought to have any known major risk factor, including radiation.”
- **Why no mention of bone tumor?**

# **Institute of Medicine DU report (2000):**

- **“The lymphatic system is an important potential target for uranium radiation because inhaled insoluble uranium oxides can remain up to several years in the hilar lymph nodes of the lung. Studying the effect of uranium exposure on lymphatic cancer is more difficult than studying lung cancer because lymphatic cancer is much less common.”**

# Hodgkin's Lymphoma Incidence

(Fahey *In press*)

- **1999 DVA DU Program:** 1 per 50 veterans  
(Equivalent to 2,000 per 100,000)
- **1999 U.S. Public:** 2.8 per 100,000 people  
(3.0 for men, 2.5 for women)
  - 5.4 per 100,000 for men and women aged 25-29
  - 4.1 per 100,000 for men and women aged 30-34

# Squibb and McDiarmid (2006)

## Summary Article on the DU Program, 1993-2005



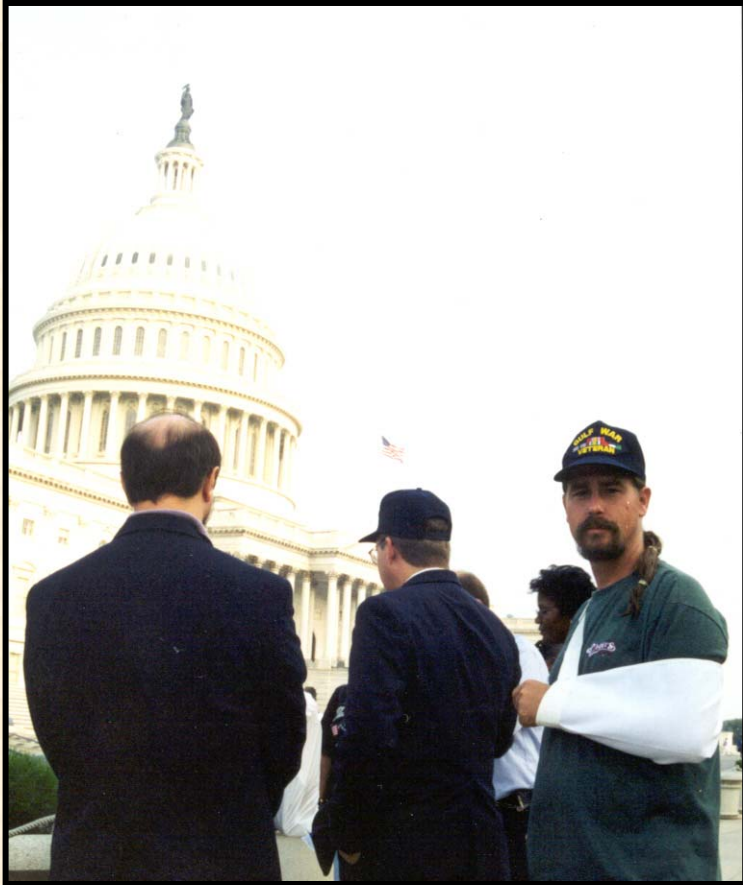
- “With the exception of the elevated urine U excretion, no clinically significant, expected U-related health effects have yet been identified in veterans with or without embedded fragments...”
- Why no mention of Hodgkin’s lymphoma or bone tumor?
- Are we getting the whole truth in journal articles written by DVA study directors?

# Summary of Reporting of a Hodgkin's Lymphoma and a Bone Tumor Among Veterans in the DU Program

Date	Document	Hodgkin's Lymphoma Mentioned?	Bone Tumor Mentioned?
October 15, 1999	Summary of DoD-DVA meeting on the DU Program, which included Kilpatrick and McDiarmid	Yes	No
January 10, 2001	Kilpatrick and Daxon briefing at NATO HQ, Brussels	No	No
January 20, 2001	McDiarmid editorial in the <i>British Medical Journal</i>	No	No
December 2001	McDiarmid et al summary article on 1999 exams	Yes	No
February 2004	McDiarmid et al summary article on 2001 exams	No	No
March 2006	Squibb and McDiarmid article summarizing findings of the DU Program, 1993-2005	No	No
July 2007	McDiarmid et al summary article on 2005 exams	No	No



# Has DU Affected Gulf War Veterans' Health?



- How many veterans were exposed? **“Thousands.”**
- How much were they exposed to? **Unknown.**
- Is the DVA study of veterans sufficiently large to inform policy decisions about Gulf War veterans health care and benefits? **No.**
- Have all observed, clinically-significant health effects among study participants been reported? **No.**

# Part II: Testing Issues For OIF and OEF Veterans



- Is the selection process excluding people who report they might have been exposed to DU?
- Is the testing method resulting in false negatives for veterans with Level II and III exposures?
- Why isn't DoD using the best available test for veterans?

# DoD asks OIF and OEF veterans about DU exposure...



UNDER SECRETARY OF DEFENSE  
4000 DEFENSE PENTAGON  
WASHINGTON, D.C. 20301-4000

APR 22 2003

PERSONNEL AND  
READINESS

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENT  
COMBATANT COMMANDERS  
DIRECTOR OF THE JOINT STAFF

SUBJECT: Enhanced Post-Deployment Health Assessments

14. While you were deployed, were you exposed to:  
(mark all that apply)

No      Sometimes      Often

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Sanitization
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Depleted Uranium (If yes, explain) _____
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Other exposures _____

17. Were you in or did you enter or closely inspect any destroyed military vehicles?

☐ No      ☐ Yes

18. Do you think you were exposed to any chemical, biological, or radiological warfare agents during this deployment?

☐ No      ☐ Don't know  
☐ Yes, explain with date and location

# ...But DVA's 2003 letter to veterans fails to mention DU or availability of DU tests

## ★★★IRAQI FREEDOM VETERANS★★★

*Information for Veterans Who Served in Southwest Asia in 2003*

### HEALTH CARE AND ASSISTANCE FOR U.S. VETERANS OF OPERATION IRAQI FREEDOM

As a result of Iraq's refusal to comply with United Nations' mandates regarding weapons of mass destruction, the U.S. began deploying troops to the Gulf region in late 2002. Coalition forces subsequently won a decisive victory over Saddam

Iraq's climate is characterized by hot summers and dry, mountainous regions. The borders experienced heavy snows that caused extensive flooding. Iraq's terrain includes reedy marshes and

### Health Risk to U.S. Service Members Serving in Iraq During 2003

According to DoD, troops may be exposed to a variety of infectious diseases. Environmental hazards also may pose a potential health risk to deployed forces, including exposure to sewage, agricultural and industrial contamination of water and food supplies, localized air pollution, and severe sand and dust storms.

The military is dealing with these risks by providing vaccinations, securing potable water and food, and using standard pest control procedures. The

US Department of Veterans Affairs, War Related Illness and Injury Study Center

<http://www.va.gov/gulfwar/docs/IraqiFreedomMay21.pdf>



# GAO 2004 Survey: Servicemembers' Indications of Suspected DU Exposure and Referrals

Excerpt from GAO Briefing for The Honorable Bob Filner, 30 September 2004

Installation	Number Indicating “Sometimes” or “Often” Exposure	Referral Made for DU Exposure Follow-up	Health Care Provider Determined No DU Referral Needed
Moody AFB Total (N=146)	19	1	17
<b>Total</b> Total (N=1,126)	32	3	26



# Helmer et al (2007)

## “Health and Exposure Concerns of Veterans Deployed to Iraq and Afghanistan”

Exposure concern	Number (%) with concern Total (N=56)
Depleted uranium	18 (32.1)

- How many of these veterans were tested for DU exposure?
- How long after their suspected exposure were they tested?
- What were the results?

# Service Summary of OIF DU Test Results 1 June 2003 to 30 September 2006

(Winkenwerder 2007)

Total Tested	Confirmed DU in Urine
2,161	9

- All nine personnel testing positive for DU have DU embedded fragments or fragment injuries
- Have there been zero inhalation exposures in Iraq since 2003?

# Army Guidelines Acknowledge Limitations of Current Testing Method

(U.S. Army Medical Command, “Medical Management of Army Personnel Exposed to Depleted Uranium (DU),” 5 March 2005)

(c) Post-exposure urine specimens should be collected within 180 days of suspected DU exposure. Because deployments may last longer than 180 days, collection may be deferred until redeployment. Urine specimens collected more than 180 days after exposure remain valid for Level I exposures but may not support the documentation of Level II and Level III exposures to DU. In accordance with DoD policy, an identified Level II Soldier will have a urine specimen collected; a Level III potentially exposed Soldier does not require DU bioassay; however, a physician may choose to perform one based on medical indications or on the potentially exposed individual's request.

- Why use a test with a 180-day period of validity?
- Why use a test that “may not support the documentation of Level II and Level III exposures to DU”?
- Does this explain why only veterans wounded by DU fragments have tested positive for DU?

# What about OEF Exposures?

- How and where were DU munitions used during OEF?
- Have US troops operated in areas of Afghanistan where the Soviets used DU munitions during the 1980s?
- How many OEF veterans (including those who served at K-2 in Uzbekistan) have been tested for DU exposure, and what are the results?

## Environmental Conditions at Karshi Khanabad (K-2)

*A Collaborative Effort of DHCC, AFIERA, NEHC, and USACHPPM*

### What kind of assessment was done at K-2?

They also found smaller, localized areas of surface dirt contaminated with asbestos and low-level radioactive processed uranium, both from the destruction of Soviet missiles several years ago.

Finally, the amount of dust and other particles in the air was often high, varying with the season and weather, e.g., dust storms.

### What did post-deployment surveys show?

Service members are supposed to fill out a post-deployment survey (DD Form 2796) before leaving the theater. This is one of the ways the services monitor the conditions experienced by deployed troops. Of those surveys in which service members reported exposure concerns, the most common concerns were depleted uranium, petroleum products, tuberculosis, radio-frequency exposure, and general radiation exposure.

# Further questions about the selection and testing process

- Since 2001, how many OEF and OIF veterans have indicated a “sometimes” or “often” exposure to DU on post-deployment surveys? How many of these veterans have been tested?
- How many veterans have been tested more than 180 days after a known or suspected exposure?
- Why is DoD using a test with a six-month effectiveness limit when the UK Ministry of Defence is using the best available method, which can accurately detect a DU exposure more than a decade after exposure (Parrish et al 2006)?
- On what basis are health care providers denying tests to veterans who suspect they were exposed to DU?



# Testing Issues For OIF and OEF Veterans



- Is the selection process excluding people who report they might have been exposed to DU? **Yes.**
- Is the testing method resulting in false negatives for veterans with Level II and III exposures? **Potentially.**
- Why isn't DoD using the best available test for veterans?  
**Are financial and political considerations more important than accurate test results?**



# **Recommendations (1): Study of Veterans**

1. Conduct a health survey of all Gulf War veterans with known or likely Level I and II DU exposures
2. Using the best available test developed by Parrish et al (2006), test a representative sample of veterans with known or suspected Level I, II, and III exposures
3. Create an oversight board to review the conduct and output of the DVA study

# **Recommendations (2):**

## **Testing of OIF and OEF Veterans**

4. Re-test a representative sample of veterans using the best available test
5. Use the best available test for all future tests
6. Expand and improve the reporting process to include selection method, test method, time since exposure at time of test, area of service, branch of service, unit, rank, age, and gender.
7. Create an oversight board to review the selection process, the re-testing process, and future testing

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